UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/622,083	07/16/2003	Arun Somani	900.190US1	1845

21186 7590 09/25/2006

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.
P.O. BOX 2938
MINNEAPOLIS, MN 55402

EXAMINER	
WARREN, DAVID S	

ART UNIT	PAPER NUMBER
2837	

DATE MAILED: 09/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/622,083	SOMANI ET AL.	
	Examiner	Art Unit	
	David S. Warren	2837	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16,18-47 and 49-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16,18-47 and 49-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1 – 3, 5 – 12, 15, 18, 20, 24 – 34, 36 – 43, 46, 49, 51, 55 - 57, 59, 62, and 63 rejected under 35 U.S.C. 103(a) as being unpatentable over Chantzis et al (6,417,435) in view of Ludwig (2004/0069128). Regarding claims 1 and 32, Chantzis discloses the use of a computerized method of recognizing music comprising receiving an input data representing a played note (via microphone 12), performing time alignment (i.e., identifying time and duration of a played note – col. 7, lines 27 – 32), extracting features from the input data (e.g., pitch, duration, frequency, timbre, etc - col. 7, lines 27 – 29), comparing the extracted features to a dataset of saved note features to determine a matching note (the Applicant's "dataset" is synonymous with Chantzis' "performer selected" scales arpeggios, etudes, etc – col. 12, lines 2 – 8; col. 7, 54 - 59). Chantzis does not teach the use of weighting a subset of extracted features. Ludwig discloses weighting of extracted features (paragraph [0644]; here, "modes" is synonymous with harmonics and, as Applicant defines "peak values" and "frequency locations"). It appears from Applicant's specification, paragraphs [0089] though [0094], that the Applicant is weighting both the *values* and *differences* in an attempt to define a

note when two similar notes may have variations in harmonic signature. While Ludwig may be doing this for a different reason, Ludwig nonetheless shows that weighting of a Fourier component enhances audio signature characteristics for either analysis or reproduction. It would have been obvious to combine the teachings of Chantzis and Ludwig to obtain a sound-to-digital converter wherein features have been extracted and weighted. The motivation for making this combination, is found in Ludwig, wherein Ludwig states (paragraph [0664]:

> weighting the higher modes [i.e., harmonics, identical to Applicant's "peak values" and "frequency locations" discussed in specification paragraphs [0092] and [0093]] of vibration more strongly would make the synthesis mimic the vibrating element's harmonic balance; weighting the lower more strongly would make the synthesis complement the vibrating element's harmonic balance, etc.

In other words, weighting harmonics (or frequency locations and peaks) provides a more accurate (or desirable) representation of a musical note (to be analyzed or reproduced). Regarding claims 2 and 33, Chantzis shows analog to digital conversion (col. 6, lines 39 – 49). Regarding claims 3 and 34, the use of Fast Fourier Transforms are shown by Chantzis in col. 7, second paragraph. Regarding claims 5 and 36, Chantzis discloses matching current notes (those stored) with played notes (see element 48, fig. 2A) and states (claim 1, step d) "at least one" (i.e., one or more, e.g., "four") of pitch, rhythm, frequency waveform, amplitude waveform, timbre, duration, position, velocity, acceleration and time" (i.e., "six" note features). It is important to note that "timbre" inherently implies analysis of harmonic modes, Fourier components, peak values, and frequency locations. Regarding claims 6 and 37, the "pitch" is synonymous with "fundamental" (col. 7, lines 27 – 29). Regarding claims 7 and 38, see

col. 7, lines 27 – 29. Regarding claims 8, 9, 39, and 40, Chantzis discloses analyzing timbre: Timbre is the sum total of all harmonics present in a given waveform; thus, the Examiner maintains that Chantzis discloses the use of detecting one, five (or any number) of harmonics. Regarding claims 10 and 41, Chantzis discloses "peaks correspond to the point in time when [the] pitches were heard" (col. 7, 24 – 32). The limitations of claims 11 and 42 have been addressed supra with respect to claims 1 and 32. Regarding claims 12 and 43, Chantzis discloses determining the time and duration of a played note (col. 7, lines 27 – 32), this is synonymous with finding the start and ending points of the input note data. Regarding claims 15 and 46, Chantzis discloses the use of retrieving a set of musical reference notes (i.e., the scales, arpeggios, and etudes; col. 9, lines 51 – 60), displaying a portion of the data (on display 26), receiving a played note (into microphone 12), comparing the played note and current note (col. 12, 29 – 32), and displaying an indication of a match (col 12, lines 52 – 57). The added limitation of "training a system to recognize a set of notes" appears to be merely inserting notes into the storage unit to be used as references by which to compare a user's performance. The Examiner makes this interpretation based on Applicant's paragraph [0056] which states:

> The training process includes recording the instrument's music note pattern. In some embodiments, a user is prompted to play a series of notes in a range. The user may be able to change the tuning range by modifying the first note and last note of the range through a user interface. After inputting the expected tuning range, the system is ready to be trained. In some embodiments, the system displays a window that shows the current note that needs to be trained into the system. For each input note, the program will show the information of this note and current status. In some embodiments, the user can find the current training note, the expected note frequency, the pattern of the note, and the tuning territory on the training user interface. The training interface prompts the user to play one

> note at a time until the user is satisfied with the training. In some embodiments, the user may confirm each note before the system proceeds further. In some embodiments, the user can choose "Next" to train for the next note, "Replay" to retrain for the current note or "Back" for a previous note. In some embodiments, if a user does not want to continue the training, a "Done" user interface element may be selected, and the rest of the note pattern in the tuning territory will be filled by default values. The program will continue until the last note in the tuning range is received. [Emphasis added]

While Chantzis does not disclose entering a single note per se, Chantzis does disclose entering any desired note pattern (e.g., a mode, or song segment). It would certainly be obvious to one of ordinary skill in the art to provide an ability to enter one note at a time rather than several (i.e., a mode or song segment). The motivation for making this modification would be to allow a user, who may be unskilled in music performance, to slowly enter an entire piece one note at a time. Regarding claims 18 and 49, "pre-programming" the scales, arpeggios, and etudes is deemed to be functionally equivalent to "composing" (col. 12, lines 5 – 8). Regarding claims 20 and 51, a musical segment is synonymous with scales, arpeggios, and etudes. Regarding claims 24, Chantzis discloses the use of a processor (18) and a memory (20) coupled to a processor (see fig. 1), an A/D converter (col. 6, lines 39 – 49), sound input device couple to the A/D converter (microphone 12, col. 6, lines 39 – 49), a database (22, fig. 1), a display (26), and identifies the notes based on matching data in near real-time (at the end of a comparison performance). As stated supra with respect to claims 1 and 32, Chantzis does not teach the use of weighting a subset of extracted features. Ludwig does address such a feature. It would have been obvious to combine the teachings of Chantzis and Ludwig to obtain a sound-to-digital converter wherein features have been

extracted and weighted. The motivation for making this combination, is found in Ludwig, wherein Ludwig states (paragraph [0664]:

> weighting the higher modes [i.e., harmonics, identical to Applicant's "peak values" and "frequency locations" discussed in specification paragraphs [0092] and [0093]] of vibration more strongly would make the synthesis mimic the vibrating element's harmonic balance; weighting the lower more strongly would make the synthesis complement the vibrating element's harmonic balance, etc.

In other words, weighting harmonics (or frequency locations and peaks) provides a more accurate (or desirable) representation of a musical note. Regarding claim 25, Chantzis shows a soundcard (col. 13, claim 4). Regarding claim 26, see element 12 (also this is discussed supra). Regarding claim 27, MIDI is shown in col. 6, lines 61 – 64. Regarding claim 28, LCD is shown in col. 10, lines 35 – 37. Regarding claims 29, see col. 9, lines 45 – 50. Regarding claims 30 and 31, see element 14 and col. 6, lines 65 – 66. Regarding claim 55, Chantzis discloses the use of database having at least one note (22), a sound input interface (12), a pattern matching module (for matching pitches, durations, etc. of scales, apeggios, etc.), and a compose segment (i.e., "programmable musical passages"; col. 15, lines 51 – 53). Regarding claim 56, see element 26 of Chantzis. Regarding claim 57, see the "test storage area" (col. 15, lines 45 – 47). Regarding claim 59, Chantzis displays scales, arpeggios, and etudes (col. 9, paragraph 7). Regarding claim 62, the analysis and statistics of Chantzis are synonymous with identifying whether a note is played correctly. Regarding claim 63, see Chantzis' claim 1, step (j).

2. Claims 4, 13, 14, 35, 44, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chantzis (discussed supra) in view of Kuhn ("A Real-Time Pitch

Recognition Algorithm for Music Applications. 1990) Regarding claims 13, 14, 44, and 45, the methods used to determine the stop and start note times are deemed to be functionally equivalent to those of Chantzis and Kuhn (see the Examiner's remarks in "Response to Arguments" below). Regarding claims 4 and 35, the teachings of Chantzis have been discussed above. Chantzis does not disclose the use of 512 point FFT in performing time alignment. Kuhn discloses the use of 512 point FFT in a real-time pitch recognition system (page 62, middle of first paragraph in 2nd column). It would have been obvious to one of ordinary skill in the art to combine the teachings of Chantzis and Kuhn to obtain a pitch recognition system having a 512 point FFT system. The motivation for making this combination if found in Kuhn who states: "a system designed to cover a three-octave range while maintaining a resolution of 2 percent or better at all frequencies requires a 512-point transform."

3. Claims 9 and 40 rejected under 35 U.S.C. 103(a) as being unpatentable over Chantzis (supra) in view of Hall (6,725,108). The teachings of Chantzis have been discussed supra. While Chantzis discloses the use of detecting and extracting timbre (which requires the detection of harmonics) Chantzis does not explicitly disclose the use of detecting five harmonics. Hall discloses the use of detecting five harmonics (see fig. 7; "overtones" are synonymous with harmonics). It would have been obvious to one of ordinary skill in the art to combine the teachings of Chantzis and Hall to obtain a pitch recognition system that detects five harmonics. The motivation for making this combination is that it may not be necessary to detect, say, 10 or 12 harmonics,

therefore, by only detecting five, storage and processing may be made to be more efficient.

4. Claims 16, 19, 21 – 23, 47, 50, 52 – 54, 58, 60, and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chantzis (discussed supra) in view of Taruguchi et al. (6,380,474). The teachings of Chantzis have been discussed above. Chantzis does not disclose the use of changing color nor changing cross-hatching of a played note. Taruguchi discloses the use of a pitch recognition system wherein notes currently being played are visually changed in color and or highlight (col. 5, lines 39 – 41 and lines 44 – 49). The Examiner acknowledges that Taruguchi does not alter the appearance of notes whether they have been played correctly. However, since Chantzis provides data on whether notes were played correctly (an analysis) and Taruguchi provides information by coloring a note, the Examiner maintains that one of ordinary skill would think to combine teachings of Chantzis with Taruguchi to provide feedback by coloring or cross-hatching a note. The motivation for making this combination lies within the Taruguchi teachings, wherein real-time feedback by coloring (or cross-hatching) a note is coloring provides a visual cue as to the correctness of a played note: Visual (i.e., non-verbal) cues are often easier and quicker to understand than statistical results. Regarding claims 19, 50, 58, 60, and 61, the phrase "flash card" is typically employed to "ask a question" with an "answer" available to check the answer. This is precisely how the devices to Chantzis operates; a user is "asked" to perform a scale and/or arpeggio, the user "answers" by playing the scale or arpeggio wherein the user can check his or her performance by viewing the statistics. The Examiner,

therefore, maintains that the system of Chantzis is functionally equivalent to a "flash card" or flash card file.

Response to Arguments

5. Applicant's arguments with respect to claims 1 – 16, 18 – 47, and 49 - 63 have been considered but are moot in view of the new ground(s) of rejection. The Examiner would like to add comments to the above rejection. First, the Applicant has amended claims 1, 24, 32, and 55, to include a "weighting" scheme to assist in analysis. The Examiner notes that in the specification, that the Applicant is weighting both the peak values and frequency locations. However, the Examiner assumes that this weighting is done to emphasize a fundamental when, say, a higher harmonic has a larger peak. If so, it should be noted that Chantzis (or any other pitch determining device) would inherently perform this feature – otherwise accurate pitch could not be determined. In other words, in order to determine pitch, the fundamental must, in some way, be emphasized (or weighted) over a higher harmonic. Second, the Applicant has amended claims 15 and 46 to include a "training of the system" – as stated supra in the Office Action, this appears to be merely adding to notes used as a reference to a musicians performance.

6. The Applicant argues against the propriety of the Examiner's §103 rejections stating that all features of the independent claims (e.g., weighting, training, etc.) are not found in the references and therefore obviousness cannot be established. The new ground of rejection renders this argument moot.

7. The Applicant argues that, with respect to claims 11, 13, 14, 42, 44, and 45, the Examiner's use of "design choice" was inappropriate. The Examiner concurs and this has not been included in the above rejection. However, the Examiner is maintaining that the features of these claims are functionally equivalent. The purpose of both the Applicant's invention and the teachings of Chantzis is to compare notes, this includes pitch and duration. To compare duration, it is necessary that a start and stop time be established. The Applicant has not provided any advantage to the use of a sum of squares of the amplitude (or sum of absolute amplitude). In other words, both the Applicant and Chantzis provide the same result.

8. The Applicant also argues that the Examiner took "official notice" in the previous Office Action. The Examiner did not take Official Notice for any element in the previous Office Action. The Applicant is requested to establish any specific limitation that the Examiner did not address.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Warren whose telephone number is 571-272-2076. The examiner can normally be reached on M-F, 9:30 A.M. to 6:30 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lincoln Donovan can be reached on 571-272-2837. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

dsw

LINCOLN DONOVAN
SUPERVISORY PATENT EXAMINER